

IN THE CLAIMS:

Kindly amend the claims, as follows:

1. (Currently Amended) A method to perform low-density parity-check code encoding of user data u of length N_u , by inserting parity data p of length N_p into output data c of length N in accordance with a parity matrix H such that $H \cdot c = 0$, comprising the steps of:

- (a) receiving the user data of block length N_u ;
- (b) decomposing $H \cdot c$ into a first component $H_u \cdot u$ corresponding to the user data and a second component $H_p \cdot p$ corresponding to the parity data such that $H_u \cdot u + H_p \cdot p = 0$;
- (c) calculating a vector $\underline{u} = H_u \cdot u$; and
- (d) calculating $p = H_u^{-1} \cdot \underline{u} \cdot H_p^{-1}$.

2. (Original) The method of Claim 1, wherein H_u comprises a $N_p \times N_u$ matrix and H_p comprises a $N_p \times N_p$ matrix.

3. (Original) The method of Claim 1, further comprising the step of:

- (e) receiving address information,
wherein step (c) is performed in accordance with step (e).

4. (Original) The method of Claim 1, wherein step (c) comprises the step of:

- (f) updating elements of \underline{u} as follows:
 $u(i) = u(i) \oplus \text{bit}$.

5. (Currently Amended) The method of Claim 1, wherein step (d) comprises the step of:

- (g) reducing a row weight of $[[H_u^{-1}]] H_p^{-1}$ by representing $[[H_u^{-1}]] H_p^{-1}$ as $M1 * M2$.

6. (Currently Amended) The method of Claim 1, wherein step (d) comprises the step of:

(g) reducing a row weight of $[[\mathbf{H}_u^{-1}]] \mathbf{H}_p^{-1}$ by representing $[[\mathbf{H}_u^{-1}]] \mathbf{H}_p^{-1}$ as $\prod_{i=1}^s M_i$.

7. (Original) The method of Claim 1, wherein step (c) is performed prior to step (d).

8. (Currently Amended) A low-density parity-check code encoder to encode user data u of length N_u , by inserting parity data p of length N_p into output data c of length N in accordance with a parity matrix H such that $H \cdot c = 0$, comprising:

an input to input the user data of block length N_u ;

an H c decomposer to decompose $H \cdot c$ into a first component $H_u \cdot u$ corresponding to the user data and a second component $H_p \cdot p$ corresponding to the parity data such that $H_u \cdot u + H_p \cdot p = 0$;

a \underline{u} calculator to calculate a vector $\underline{u} = H_u \cdot u$; and

a $p = \underline{P} \underline{u}$ calculator to calculate $p = H_u^{-1} \cdot \underline{u} \cdot H_p^{-1}$.

9. (Original) The encoder of Claim 8, wherein H_u comprises a $N_p \times N_u$ matrix and H_p comprises a $N_p \times N_p$ matrix.

10. (Original) The encoder of Claim 8, further comprising:

a second input to input address information,

wherein said \underline{u} calculator calculates the vector $\underline{u} = H_u \cdot u$ in accordance with said second input.

11. (Original) The encoder of Claim 8, wherein said \underline{u} calculator updates elements of \underline{u} as follows:

$u(i) = u(i) \oplus \text{bit}$.

12. (Currently Amended) The encoder of Claim 8, wherein said $p = \underline{P} \underline{u}$ calculator reduces a row weight of $[[\underline{H}_u^{-1}]] \underline{H}_p^{-1}$ by representing $[[\underline{H}_u^{-1}]] \underline{H}_p^{-1}$ as $M1 * M2$.

13. (Currently Amended) The encoder of Claim 8, wherein said $p = \underline{P} \underline{u}$ calculator reduces a row weight of $[[\underline{H}_u^{-1}]] \underline{H}_p^{-1}$ representing $[[\underline{H}_u^{-1}]] \underline{H}_p^{-1}$ as $\prod_{i=1}^s M_i$.

14. (Currently Amended) The encoder of Claim 8, wherein said \underline{u} calculator calculates the vector $\underline{u} = \underline{H}_u \cdot \underline{u}$ prior to said $p = \underline{P} \underline{u}$ calculator calculating $p = \underline{H}_u^{-1} \cdot \underline{u} \underline{H}_p^{-1} \cdot \underline{u}$.

15. (Currently Amended) A computer program to perform low-density parity-check code encoding of user data \underline{u} of length N_u , by inserting parity data \underline{p} of length N_p into output data \underline{c} of length N in accordance with a parity matrix \underline{H} such that $\underline{H} \cdot \underline{c} = 0$, comprising the steps of:

- (a) receiving the user data of block length N_u ;
- (b) decomposing $\underline{H} \cdot \underline{c}$ into a first component $\underline{H}_u \cdot \underline{u}$ corresponding to the user data and a second component $\underline{H}_p \cdot \underline{p}$ corresponding to the parity data such that $\underline{H}_u \cdot \underline{u} + \underline{H}_p \cdot \underline{p} = 0$;
- (c) calculating a vector $\underline{u} = \underline{H}_u \cdot \underline{u}$; and
- (d) calculating $p = \underline{H}_u^{-1} \cdot \underline{u} \underline{H}_p^{-1} \cdot \underline{u}$.

16. (Original) The computer program of Claim 15, wherein \underline{H}_u comprises a $N_p \times N_u$ matrix and \underline{H}_p comprises a $N_p \times N_p$ matrix.

17. (Original) The computer program of Claim 15, further comprising the step of:

- (e) receiving address information,
wherein step (c) is performed in accordance with step (e).

18. (Original) The computer program of Claim 15, wherein step (c) comprises the

step of:

- (g) updating elements of \underline{u} as follows:
 $u(i) = u(i) \oplus \text{bit}.$

19. (Currently Amended) The computer program of Claim 15, wherein step (d) comprises the step of:

- (g) reducing a row weight of $[[\underline{H}_u^{-1}]] \underline{H}_p^{-1}$ by representing $[[\underline{H}_u^{-1}]] \underline{H}_p^{-1}$ as $M1 * M2.$

20. (Currently Amended) The computer program of Claim 15, wherein step (d) comprises the step of:

- (g) reducing a row weight of $[[\underline{H}_u^{-1}]] \underline{H}_p^{-1}$ by representing $[[\underline{H}_u^{-1}]] \underline{H}_p^{-1}$ as $\prod_{i=1}^s M_i .$

21. (Original) The computer program of Claim 15, wherein step (c) is performed prior to step (d).

22. (Currently Amended) A data transmission system for transmitting user data to and receiving data from a communication channel, comprising:

a low-density parity-check code encoder to encode user data u of length N_u , by inserting parity data p of length N_p into output data c of length N in accordance with a parity matrix H such that $H \cdot c = 0$, comprising:

an input to input the user data of block length N_u ;

an H c decomposer to decompose $H \cdot c$ into a first component $H_u \cdot u$

corresponding to the user data and a second component $H_p \cdot p$ corresponding to the parity data such that $H_u \cdot u + H_p \cdot p = 0$;

a \underline{u} calculator to calculate a vector $\underline{u} = H_u^{-1} \cdot u$; and

a $p = \underline{P} \underline{u}$ calculator to calculate $p = H_u^{-1} \cdot u \cdot H_p^{-1} \cdot \underline{u}$;

a transmitter to transmit an output of said low-density parity-check code encoder to

the communication channel;

a soft channel decoder to decode data from the communication channel; and

a soft low-density parity-check code decoder to decode data decoded by said soft channel decoder.

23. (Original) The system of Claim 22, wherein \mathbf{H}_u comprises a $N_p \times N_u$ matrix and \mathbf{H}_p comprises a $N_p \times N_p$ matrix.

24. (Original) The system of Claim 22, further comprising:

an address generator to generate address information in accordance with the user data;

second input means for inputting address information,

a second input to input address information,

wherein said \underline{u} calculator calculates the vector $\underline{u} = \mathbf{H}_u \cdot \mathbf{u}$ in accordance with said second input.

25. (Original) The system of Claim 22, wherein said \underline{u} calculator updates elements of \underline{u} as follows:

$$u(i) = u(i) \oplus \text{bit}.$$

26. (Currently Amended) The system of Claim 22, wherein said $p = \underline{P} \underline{u}$ calculator reduces a row weight of $[[\mathbf{H}_u^{-1}]] \underline{\mathbf{H}_p^{-1}}$ by representing $[[\mathbf{H}_u^{-1}]] \underline{\mathbf{H}_p^{-1}}$ as $M1 * M2$.

27. (Currently Amended) The system of Claim 22, wherein said $p = \underline{P} \underline{u}$ calculator reduces a row weight of $[[\mathbf{H}_u^{-1}]] \underline{\mathbf{H}_p^{-1}}$ representing $[[\mathbf{H}_u^{-1}]] \underline{\mathbf{H}_p^{-1}}$ as $\prod_{i=1}^s M_i$.

28. (Currently Amended) The system of Claim 22, wherein said \underline{u} calculator calculates the vector $\underline{u} = \mathbf{H}_u \cdot \mathbf{u}$ prior to said $p = \underline{P} \underline{u}$ calculator calculating $p = \mathbf{H}_u^{-1} \cdot \underline{\mathbf{H}_p^{-1}} \cdot \underline{u}$.

29. (Currently Amended) A low-density parity-check code encoder to encode user data u of length N_u , by inserting parity data p of length N_p into output data c of length N in accordance with a parity matrix H such that $H \cdot c = 0$, comprising:

input means for inputting the user data of block length N_u ;

H c decomposer means for decomposing $H \cdot c$ into a first component $H_u \cdot u$ corresponding to the user data and a second component $H_p \cdot p$ corresponding to the parity data such that $H_u \cdot u + H_p \cdot p = 0$;

\underline{u} calculating means for calculating a vector $\underline{u} = H_u \cdot u$; and

$p = \underline{P} \underline{u}$ calculating means for calculating $p = H_u^{-1} \cdot \underline{u} \cdot H_p^{-1} \cdot \underline{u}$.

30. (Original) The encoder of Claim 29, wherein H_u comprises a $N_p \times N_u$ matrix and H_p comprises a $N_p \times N_p$ matrix.

31. (Original) The encoder of Claim 29, further comprising:

second input means for inputting address information,

wherein said \underline{u} calculating means calculates the vector $\underline{u} = H_u \cdot u$ in accordance with said second input means.

32. (Original) The encoder of Claim 29, wherein said \underline{u} calculating means updates elements of \underline{u} as follows:

$$u(i) = u(i) \oplus \text{bit}.$$

33. (Currently Amended) The encoder of Claim 29, wherein said $p = \underline{P} \underline{u}$ calculating means reduces a row weight of $[[H_u^{-1}]] \underline{H_p^{-1}}$ by representing $[[H_u^{-1}]] \underline{H_p^{-1}}$ as $M1 * M2$.

34. (Currently Amended) The encoder of Claim 29, wherein said $p = \underline{P} \underline{u}$ calculating means reduces a row weight of $[[H_u^{-1}]] \underline{H_p^{-1}}$ representing $[[H_u^{-1}]] \underline{H_p^{-1}}$ as $\prod_{i=1}^s M_i$.

35. (Currently Amended) The encoder of Claim 29, wherein said \underline{u} calculating means calculates the vector $\underline{u} = \mathbf{H}_u \cdot \mathbf{u}$ prior to said $\mathbf{p} = \mathbf{P} \underline{u}$ calculating means calculating $\mathbf{p} = \mathbf{H}_u^{-1} \cdot \underline{u} + \mathbf{H}_p^{-1} \cdot \underline{u}$.

36. (Currently Amended) A data transmission system for transmitting user data to and receiving data from a communication channel, comprising:

low-density parity-check code encoding means to encode user data \mathbf{u} of length N_u , by inserting parity data \mathbf{p} of length N_p into output data \mathbf{c} of length N in accordance with a parity matrix \mathbf{H} such that $\mathbf{H} \cdot \mathbf{c} = 0$, comprising:

input means for inputting the user data of block length N_u ;

$\mathbf{H} \cdot \mathbf{c}$ decomposer means for decomposing $\mathbf{H} \cdot \mathbf{c}$ into a first component $\mathbf{H}_u \cdot \mathbf{u}$ corresponding to the user data and a second component $\mathbf{H}_p \cdot \mathbf{p}$ corresponding to the parity data such that $\mathbf{H}_u \cdot \mathbf{u} + \mathbf{H}_p \cdot \mathbf{p} = 0$;

\underline{u} calculating means for calculating a vector $\underline{u} = \mathbf{H}_u \cdot \mathbf{u}$; and

$\mathbf{p} = \mathbf{P} \underline{u}$ calculating means for calculating $\mathbf{p} = \mathbf{H}_u^{-1} \cdot \underline{u} + \mathbf{H}_p^{-1} \cdot \underline{u}$;

transmitting means for transmitting an output of said low-density parity-check code encoding means to the communication channel;

soft channel decoding means for decoding data from the communication channel; and

soft low-density parity-check code decoding means for decoding data decoded by said soft channel decoding means.

37. (Previously Presented) The system of Claim 36, wherein \mathbf{H}_u comprises a $N_p \times N_u$ matrix and \mathbf{H}_p comprises a $N_p \times N_p$ matrix.

38. (Previously Presented) The system of Claim 36, further comprising:

address generator means for generating address information in accordance with the user data;

second input means for inputting the address information,

wherein said u calculating means calculates the vector $\underline{u} = \mathbf{H}_u \cdot \mathbf{u}$ in accordance with said second input means.

39. (Previously Presented) The system of Claim 36, wherein said u calculating means updates elements of u as follows:

$$u(i) = u(i) \oplus \text{bit}.$$

40. (Currently Amended) The system of Claim 36, wherein said $p = \underline{P} \underline{u}$ calculating means reduces a row weight of $[[\mathbf{H}_u^{-1}]] \underline{\mathbf{H}_p^{-1}}$ by representing $[[\mathbf{H}_u^{-1}]] \underline{\mathbf{H}_p^{-1}}$ as $M1 * M2$.

41. (Currently Amended) The system of Claim 36, wherein said $p = \underline{P} \underline{u}$ calculating means reduces a row weight of $[[\mathbf{H}_u^{-1}]] \underline{\mathbf{H}_p^{-1}}$ representing $[[\mathbf{H}_u^{-1}]] \underline{\mathbf{H}_p^{-1}}$ as $\prod_{i=1}^s M_i$.

42. (Currently Amended) The system of Claim 36, wherein said u calculating means calculates the vector $\underline{u} = \mathbf{H}_u \cdot \mathbf{u}$ prior to said $p = \underline{P} \underline{u}$ calculating means calculating $p = \underline{\mathbf{H}_u^{-1} \cdot \underline{u}} \underline{\mathbf{H}_p^{-1}} \cdot \underline{u}$.